MECHANICS.

Conducted by B. F. FINKEL, Springfield, Mo. All contributions to this department should be sent to him.

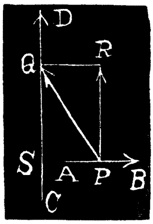
SOLUTIONS OF PROBLEMS.

28. Proposed by O. W. ANTHONY, Professor of Mathematics, New Windsor College, New Windsor, Maryland.

A movable finite wire carrying a current of electricity is perpendicular to and on one side of an infinite wire also carrying a current. Investigate the motion of the movable wire.

Solution by the PROPOSER.

Let AB be the finite wire, and DC the infinite wire. Let the current flow away from the infinite wire in the short one. Also call μ_1, μ_2 the current strengths of the two currents, and m the power of the finite wire. Then $df_{PQ}=\mu_1\mu_2\dfrac{dxdz}{x^2+z^2}$, $x=QS$, $z=PS$. Resolving forces perpendicular and parallel to DC we have



$$df_{PR}=\mu_1\mu_2\frac{xdxdz}{(x^2+z^2)^{\frac{3}{2}}}.$$

$$\therefore f_{PR}=2\mu_1\mu_2\int_{z_1}^{z_2}\int_0^{\infty}\frac{xdxdz}{(x^2+z^2)^{\frac{3}{2}}}.$$

$$=2\mu_1\mu_2\log\left(\frac{z_2}{z_1}\right).$$

$$\therefore \frac{d^2s}{dt^2}=\frac{2}{m}\mu_1\mu_2\log\left(\frac{z_2}{z_1}\right).$$

$$s=\frac{1}{m}\mu_1\mu_2\log\left(\frac{z_2}{z_1}\right)t^2+k_1t+k_2.$$

29. Proposed by J. A. CALDERHEAD, A. B., Superintendent of Schools, Limaville, Ohio.

Show that if a body be projected from the angle A of a plane triangle ABC so as to strike the side CB at a point D, then, if its course after reflection at D be parallel to AB, $\tan\angle DAB=\dfrac{(1+e)\cot B}{1-e\cot^2 B}$.

Solution by ALFRED HUME, C. E., D. Sc., Professor of Mathematics in the University of Mississippi, University P. O., Mississippi.

The angle between the course of the body before impact and the side CB is $180^\circ-(B+DAB)$.

$$\therefore e=\frac{\tan B}{\tan[180^\circ-(B+DAB)]};$$